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ABSTRACT

Results of 1983 and 1984 surveys of faculty and students at Drexel University are reviewed to evaluate the effects of the requirement that incoming students must buy a microcomputer. Slightly more than half the faculty were computer-competent (i.e., had considerable experience with at least one class of computer, with using computers in teaching, or with using computers for research or consulting). Positive attitudes about the requirement were expressed by 68% of the faculty. A comparison of 1983 and 1984 student surveys indicated the following: 97% of male freshmen in 1984 attended high schools offering computer courses, compared to 88% in 1983; in both years, males had more exposure to computing; 40% of 1984 entering male freshmen and 20% of 1983 male freshmen had owned a programmable computer during the prior year, compared with 25% of females in 1984, and 9% of females in 1983; 94% of males and 88% of females were pleased that they would own a microcomputer (a Macintosh); females discussed computers less frequently than males; and both males and females showed more condemnation of computer-related crimes in 1984 than in 1983. The responses of Drexel students were compared to responses of females at Barnard College. Reasons for choosing Drexel and Barnard were also compared. (SW)

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Computers, Sex, and Society

Newspapers and magazines have capitalized on the recent enormous spread of interest in computing by publishing speculations about anticipated effects from the proliferation of computers. I do not intend to add to that speculation. Instead, I hope to intrigue you with evidence.

For more than a year, faculty and students at Drexel University in Philadelphia have participated in a study of how the growing use of computers is affecting society. The study began shortly after an announcement that freshmen to be admitted in Fall of 1983 would be required to have access to a microcomputer. At the time, most members of our faculty, like faculty elsewhere, knew little about computers. We learned just how little through responses to a questionnaire distributed in May 1983.

The faculty questionnaire asked about experience with computers and also about values, educational histories, teaching styles, and views on possible changes that might result from the microcomputer decision. Responses to this questionnaire yielded baseline information about the faculty at the brink of change.

Responses came from 310 of the 335 (92.5%) full-time members of the academic faculty. Seventy-six taught in the College of Engineering; 77 taught in the College of Science; 55 taught in the College of Business and Administration; and 102 were spread amongst three liberal arts colleges.[1]

Conditions seemed ripe for learning how technical innovation affects an existing authority structure. At a university, rank is presumed to depend on relative competence. The possibility that knowledge of computing would soon be seen as an important component in judging academic qualifications could produce stress in the professorial status structure.

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[1] Humanities and Social Sciences; the School of Information Sciences, formerly the Graduate School of Library Science; and Nesbitt College of Nutrition, Design, and Human Development.

The questionnaire asked how much experience the respondent had using computers in teaching, research, or consulting. It also asked whether the respondent had used each of several classes of computers, ranging from minicomputers to supercomputers. Members of the faculty were classified as computer-competent if they reported having considerable experience with at least one class of computer, with using computers in teaching, or with using computers for research or consulting.

Using this criterion, slightly more than half the faculty were computer-competent: 57% of the Full Professors, 45% of the Associate Professors, and 56% of the Assistant Professors and Instructors.

Although slightly more than half the faculty had considerable experience using computers in at least one of the ways included in the questionnaire, only one in five had used computers in teaching.

The questionnaire asked faculty to note how they felt about the decision to require freshmen to purchase microcomputers. Alternatives being "upset," "worried," or "neutral," those who answered "relatively pleased" or "delighted" constituted 68% of the faculty.

Table 1 shows the proportion of faculty, by rank and computer-competence, who were pleased or delighted with the decision.

Table 1

Computing Competence and Decision Satisfaction
(% Pleased with the Decision)

Rank	Not Computer-Competent	Computer-Competent
Full Professor	(N=48) 66.7	(N=63) 71.4
Associate Professor	(N=52) 51.9	(N=42) 81.0
Assistant Professor	(N=46) 78.3	(N=59) 64.4

SOURCE	DF	CHI-SQUARE	PROB.
Intercept	1	41.46	.0001
Rank	2	0.32	.8522
Competence	1	1.36	.2444
Rank*Competence	2	9.78	.0075

Log-linear analysis (SAS, 1982) shows that neither rank nor computer-competence alone explained the variation in responses to the new emphasis on computers. An explanation could be found, however, in the interaction between rank and computer-competence, $\chi^2(2)=9.78$, $p=.0075$.

Faculty at different ranks would be differently affected by fear that new criteria for judging competence might be introduced. At the top, Full Professors need have no fear of new criteria for promotion. Nor should new criteria for promotion have much impact at the bottom of the hierarchy, since Assistant Professors already expect to be learning relevant competencies in order to improve their rank. In the middle range, at the rank of Associate Professor, shifting standards for evaluation would have the greatest impact. Having been promoted once, Associate Professors have reason to believe that they were "on the right track"; an emphasis on computing could signal a change in standards, a change for which some would be unprepared.

As shown in Table 1, Full Professors who had been using computers were only slightly more likely to be pleased than those who had not. Among Assistant Professors, those who had computing experience were slightly less likely to be pleased than those who had no experience computing. But among the Associate Professors, those who had been using computers were considerably more likely to be pleased than those who had not.

Associate Professors who were computer-competent were the group <u>most</u> likely to be satisfied with the decision. Associate Professors with little experience using computers were the group <u>least</u> likely to be satisfied with the decision. That is, faculty most likely to gain status through their knowledge were likely to be pleased and, conversely, those who had the most to lose by a shift in criteria for evaluation were least likely to be pleased.

In September, 1983, freshmen and juniors at Drexel began their participation in the study. Only the freshmen would receive computers; the juniors served as a comparison group. Responses from 1448 freshmen (78% of the class) and 640 juniors (53% of their class) showed clearly that the men had greater exposure to computers.

Among both freshmen and juniors, male students were more likely than female students to have played computer games and to have taken courses in computing. Men were more likely to have used a computer for writing as well as for analyzing data; they were more likely to have written programs in BASIC, FORTRAN, or COBOL. And they were also more likely to have gone to high schools that offered courses in computers and to have owned a programmable computer.

The questionnaire included information about values, responses to frustration, symptoms of stress, attitudes toward crime, optimism, and several other variables thought to be potentially affected by changes in the environment.

The students' answers to the questionnaire were subjected to a cluster analysis that groups responses in such a way as to identify the dimensions along which individuals in a class can be found (Varclus, SAS, 1982). The analysis establishes a multidimensional space in which members of a class can be uniquely located. From a different perspective, the dimensional structures provide pictures of the groups for which dimensions have been identified.

In 1983, men with the most experience computing appeared to be assertive, active, and confident. Among male juniors, computing was most strongly associated with self-confidence, optimism, low anxiety and being rarely angry (R^2=.54). Among male freshmen, computing was most closely associated with going to movies, museums, and the theater (R^2=.54).

Characteristics of women with the most experience computing were less clear. Among female freshmen, computing was most closely associated with being careless in protecting property, having been a victim of crimes, and having witnessed crimes (R^2=.08). Among female juniors, computing was most closely associated with an emphasis on people and a critical stance toward "hacker-type" computer crimes (R^2=.11).

With the spread of computing, computer experience became less closely tied with personality among both males and females. By September, 1984, although computing among male freshmen continued to be most closely associated with self-confidence, optimism, low anxiety, and rarely being angry, the association was weak (R^2=.03). By September, 1984, computing among female freshmen was most closely associated with having strong values; as for the men, however, the association was weak (R^2=.03).

Freshmen at Barnard[2] as well as at Drexel participated in the 1984 wave of the computer study. Although Drexel may have selectively attracted freshmen interested in computing, the women at Drexel and at Barnard gave similar pictures of their high schools: 93% of the former and 92% of the latter attended high schools that provided courses in computing.

A comparison with information from 1983 Drexel students suggests the dramatic spread in courses on computing. In 1983, 84% of the freshmen women at Drexel had reported attending high schools that taught computing.

Reporting on their high schools four[3] years before, 50% of the junior women attended high schools with courses in computing. By 1984, 97% of the male students in the freshmen class at Drexel, as compared with 88% in 1983, reported that their high schools had offered computer courses. Among male juniors in 1983, 62% reported attending high schools that taught computing.

In 1984 as in 1983, men entering Drexel were more likely than the women to have played computer games, taken courses in computing, and to have written programs in BASIC. Men were also more likely to have used computers for word processing, statistics, and analysis of data. With the exception of word processing, freshmen women at Barnard had even less exposure to computing than had freshmen women at Drexel. (See Table 2.)

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[2]At Barnard, Professors Rae Silver and Susan Sacks are principal investigators.

[3]Drexel has a cooperative program with six-month alternations between field placements and courses from Sophomore through Junior years. Thus Juniors had (typically) graduated from high school four years before.

Table 2

Computing Experience

Fall 1984	DREXEL Males N-837	DREXEL Females N-365	BARNARD Females N-338
Played games	96[a]	88[a]	84
Taken a course	82[a]	67[a]	62
Word processing	41[a]	26[a]	36[b]
Statistics	40[a]	20[ab]	12[b]
Instructional use (e.g., language)	23	20	19
Programmed in BASIC	86[a]	70[ab]	61[b]
Programmed in COBOL or FORTRAN	17	16[b]	6[b]
Used data analysis package	18[a]	7[ab]	2[b]

[a] Drexel men and women significantly different, $p<.05$.
[b] Women at Barnard and Drexel significantly different, $p<.05$.

Both sex and cohort differences appeared for comparison of proportions who owned programmable computers at the time they entered college. In 1984, 40% of the entering Drexel male freshmen, as compared with 20% in 1983, reported having owned a programmable computer during the prior year. Among females entering Drexel in 1984, 25% owned programmable computers--as did 23% of the women entering Barnard. In 1983, only 9% of the freshmen women entering Drexel had owned computers.

Freshmen indicated their reasons for choosing the college they were attending. At Drexel, the "co-op" program placing students in jobs related to their choice of professions counted as very important among the highest proportion of students, followed by academic reputation and, in third place, availability of particular curricula or courses. Students at Barnard were most likely to be attracted by the academic reputation, followed by Barnard's location, and then its proximity to Columbia.

Drexel students knew, at the time of their acceptance, that they would be required to own a Macintosh. The computer requirement at Drexel had been counted as very important by approximately a third of the freshmen who responded to the questionnaire (See Table 3).

Table 3

Reasons for Choosing Drexel/Barnard
Percent choosing "Very Important"

	DREXEL Males N-837	DREXEL Females N-365	BARNARD Females N-338
Location of (college)	20[a]	32[ab]	71[b]
Financial aid	27[a]	33[a]	34
Curricula, courses	62[a]	74[ab]	42[b]
Academic reputation	73	76	78
Athletics program	7[a]	3[a]	--
Being a women's college	--	--	31
Computer policy	39[a]	32[a]	--
Quantitative requirement	--	--	4
Friends at (college)	5[a]	2[a]	4
Co-op program	78	81	--
Facilities at Columbia	--	--	54
Parents were alumni	6	3	--
Ties with other schools[1]	--	--	14
Advice of parents, teacher,etc.	17	20[b]	28[b]

[1] Manhattan School of Music, Jewish Theological Seminary, etc.

[a] Drexel men and women significantly different, $p<.05$.
[b] Women at Barnard and Drexel significantly different, $p<.05$.

Similar proportions of freshmen at Drexel and at Barnard were attracted by academic reputation, though women at Drexel were more likely to note the importance of particular curricula or courses. Barnard students were more likely to have accepted advice of parents, teachers, and counselors in making their selection and were also more likely to have considered Barnard's location important.

In general, freshmen at Barnard looked toward the coming term with greater optimism than did freshmen at Drexel. A higher proportion of Barnard students than of Drexel students expected to be pleased with their companions, work, physical environment, and use of time. Yet a higher proportion of Drexel students expected to be pleased with the equipment and assistance available to aid them. (See Table 4.)

Table 4

Attitudes Toward College: Fall 1984

How do you expect to feel about the following during the coming term?

(% delighted or generally pleased)	DREXEL Males N-837	DREXEL Females N-365	BARNARD Females N-338
Study companions	79	81	86
Your work	82	83	90
Physical environment	74	78	88
Amount of work	24	18	34
Equipment, assistance	81	75	73
Time with family	57	61	73
People you see socially	87	87	92
Organizations to which you belong	76	76	87
Recreation facilities	87	76	77
Computer related:			
Microcomputer availability[1]	94	88	35
Support facilities	84	79	35
Amount of time using computer	74	61	21

[1] At Drexel: owning a Macintosh

Comparison of attitudes regarding computer-related items show 94% of the responding Drexel men and 88% of the responding Drexel women pleased that they will own a Macintosh. Most also anticipated being satisfied with support facilities and the amount of time they would spend using the computer.

As a measure of interests, students noted the frequency with which they had conversations about various topics. Among the male respondents, computers were more likely to be a topic of conversation than books, television, politics, clothes, health, or movies. Drexel women discussed computers less frequently than did the men. Yet the women discussed computers more often than they discussed sports, books, politics, health, or movies. Barnard women were not likely to discuss computers. (See Table 5.)

Table 5

Conversations During the Past Week: Fall 1984
(Percent responding at least three)

	DREXEL Males N-837	DREXEL Females N-365	BARNARD Females N-338
Sports	62[a]	34[ab]	25[b]
Books	32	34[b]	46[b]
Your family	52[a]	75[a]	77
Television	36	38[b]	18[b]
Politics	26[a]	19[ab]	37[b]
Education	60[a]	70[a]	70
Clothes	39[a]	67[ab]	56[b]
Travel	26[a]	37[ab]	54[b]
Food	55[a]	61[ab]	54[b]
Health	23[a]	35[a]	37
Movies	30	33	32
Computers	44[a]	36[ab]	7[b]
Cars (Drexel)/Sex (Barnard)	45[a]	38[a]	30
Scientific theories	12[a]	6[ab]	10[b]
Music	46	51	46
Art	8[a]	12[ab]	27[b]
Religion	13[a]	17[a]	23
Ethics	13	13[b]	28[b]

[a] Drexel men and women significantly different, p<.05.
[b] Women at Barnard and Drexel significantly different, p<.05.

Freshmen at Barnard and at Drexel considered a series of actions that could be--or had been--performed by youths penetrating a computer system. They were asked to select the alternative most closely representing their opinion about each. Alternatives were: a clever prank; dumb or only a little wrong; funny; funny, but wrong; and terribly wrong.

Slight majorities in each school thought that redistributing payroll checks in a large corporation would be terribly wrong. Even smaller majorities believed it terribly wrong to use the "salami" tactic of changing bank statements in order to collect 2¢ from each account. Students who believed it terribly wrong to change a formula so that a day's production of ice cream tasted bitter were in the minority, as were those who believed it terribly wrong to trade lists of potential donors so that political campaign committees mailed their requests for money to the wrong people, and those who believed it terribly wrong to order telephone sets to be sent to an empty warehouse. (See Table 6.)

Table 6

Attitudes Ttoward Computing Crimes: Fall 1984
(Percent responding "terribly wrong")

If performed by youths penetrating a computer system:	DREXEL Females N-837	DREXEL Males N-365	BARNARD Females N-338
Redistributing payroll checks in a large corporation	62	66	53
Having wrong parts sent to domestic military installation	74	80	65
Deleting criminal records from a court file	86	89	86
Making day's ice cream formula bitter	30	39	25
Trading potential donor lists during political campaign	32	43	34
Changing scoreboard in major intercollegiate game	19	38	28
Sending telephone sets to an empty warehouse	35	43	30
Collecting 2¢ from each bank account	57	63	52

As compared with responses from a year before, Drexel freshmen in 1984 showed more condemnation of actions such as those mentioned above. In 1983, 54% of the Drexel men and 57% of the Drexel women had thought redistributing payroll checks in a large corporation was terribly wrong. In 1983, 29% of the freshmen men and 37% of the freshmen women at Drexel had thought trading donor lists was terribly wrong. Only a quarter of the Drexel freshmen had thought changing the formula for ice cream was terribly wrong.

Students also were asked about their attitudes toward illegal activities that did not require penetration of a computer system. In judging these activities, respondents were asked to select from a list for which alternatives were: clever; stupid; not wrong; wrong, but not serious; and terribly wrong. Less than 10% of the students believed that copying software bought by a friend was terribly wrong. Using the Xerox to copy a whole book bought by a friend was considered terribly wrong by a similarly small proportion of the students. Students were considerably more likely to condemn copying someone's disk to use for an assignment and reporting as stolen a university Macintosh that had been sold. (See Table 7.)

Table 7

Attitudes Toward Illegal Acts: Fall 1984
(Percent responding "terribly wrong")

If performed by fellow student:	BARNARD Females N-338	DREXEL Males N-837	DREXEL Females N-365
Copying friend's software	5	7	6
Xeroxing friend's whole book	6	8	6
Omitting tips on income taxes	18	22	26
Keeping extra change, cashier error	14	14	16
Keeping book mistakenly taken with purchases	27	29	30
Borrowing a disk to copy for an assignment (without permission)	68	79	82
Reporting as stolen a university Macintosh that has been sold	76	74	75

Let me take a moment to review the evidence about computers, sex, and society. Evidence from the Drexel faculty suggests that the introduction of computers will put strain on the middle ranges in formal bureaucratic heirarchies.

Evidence from Barnard and Drexel shows that women continue to lag behind men in their interest in and use of computers. Unless women avail themselves of opportunities to become comfortable with computers, they may find themselves falling further behind in occupational competition.

The evidence on student attitudes toward illegal actions points to potential problems in attempting to enforce laws condemning computer penetration and software copyrights. If society does not adjust either by changing the laws or by more successfully inculcating a commitment to the current laws, white-collar crime is likely to expand.

Of course it is too soon to know how computers will alter social customs and opportunities. Yet preliminary evidence has begun to hint at some of the changes.

References

SAS Institute. (1982). SAS user's guide: Statistics 1982 edition. Cary, North Carolina: Author.